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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,281	09/24/2003	John Di-Yi Ou	2003B009A	1353

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EXAMINER

SINGH, PREM C

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 04/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/671,281

Applicant(s)

OU ET AL.

Examiner

Prem C. Singh

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-69 is/are pending in the application.
- 4a) Of the above claim(s) 1-31, 33-36 and 58-61 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 32, 37-57 and 62-69 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-31, 33-36, 58-61, drawn to catalyst, classified in class 502, subclass 60.
- II. Claims 32, 37-57, 62-69 drawn to process using the catalyst, classified in class 208, subclass 108.

Inventions in Group I and Group II are related as product and process of use.

The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)).

In the instant case the catalyst can be used in a materially different process, such as hydrotreating.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Attorney Andrew B. Griffis on 04-07-06 a provisional election was made with traverse to prosecute the invention of claims 32, 37-

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57, 62-69. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-31,33-36, 58-61 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

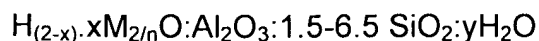
The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 32, 37-55, 62, 63, 65-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kennedy et al (US Patent 5,002,653) in view of Ou et al (US Patent 5,907,076).

Kennedy invention discloses catalytic cracking of hydrocarbonaceous feedstock using a catalyst composition which comprises a dual particle catalyst system, the first component of which comprises a crystalline aluminosilicate zeolite preferably contained within a matrix material, and the second component of which comprises a diluent having an effectiveness for metals passivation, wherein the said diluent comprises a calcium-containing material admixed with a magnesium-containing material (Column 2, lines 49-57). The overall formula for the preferred zeolites can be represented as follows:



Where M is a metal cation and n its valance and x varies from 0 to 1 and y is a function of the degree of dehydration and varies from 0 to 9. M is preferably a rare earth metal cation such as lanthanum, cerium, praseodymium, neodymium, or mixtures of these (Column 3, lines 29-38). A catalytically inert porous material may also be present in the finished catalyst (Column 5, lines 22-23). Suitable inert porous materials for use in the catalyst of the present invention include alumina, kaolin, hallosite, titania, silica, zirconia, magnesia, and mixtures thereof (Column 5, lines 35-38). The second component of the catalyst system used in the process of present invention is a separate and distinct entity, and comprises a diluent compositionally comprising two different compounds, said diluent preferably being held together by a binder to impart structural integrity to the second component (Column 5, lines 45-50). The first subcomponent comprises a magnesium-containing compound (Column 5, lines 54-55). The second subcomponent comprises a calcium-containing material (Column 5, lines 66-67). It is also preferred to include a separate binder which binds together the subcomponents of the diluent (Column 7, lines 5-6).

Kennedy invention does not disclose metal-based components.

Our invention discloses a process for removing hydrogen from a mixture which includes hydrogen and unsaturated hydrocarbons which comprises contacting the said mixture with oxygen or oxygen-containing gas over a catalyst comprising one or more than one of the metals or metal oxides selected from the elements of Groups I B, II B, III

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A, IV A, and V A of the Periodic Table of elements at reaction conditions sufficient to oxidize the hydrogen component of the mixture to form water while suppressing hydrogenation of the unsaturated hydrocarbons of the mixture (Column 10, lines 50-60).

Knowing the fact that the catalyst disclosed by Kennedy invention is used in the catalytic cracking step and the catalyst disclosed by Ou invention is used for selective hydrogen oxidation, it would have been obvious to one skilled in the art at the time the invention was made to combine the catalysts disclosed by Kennedy and Ou inventions to conduct catalytic cracking and hydrogen removal simultaneously to avoid difficult hydrogen separation steps downstream of the catalytic cracking step.

Kennedy invention teaches that (Figure 1) the cracking occurs in the presence of the fluidized catalyst composition defined herein in an elongated reactor tube (10) which is referred to as a riser (Column 8, lines 26-28). The oil charge to be cracked in the riser is, for example, a heavy gas oil (Column 8, lines 38-39).

Kennedy invention does not teach simultaneous combustion of hydrogen.

Ou invention discloses a process for removing hydrogen from a mixture which includes hydrogen and reactive unsaturated hydrocarbons (Column 1, lines 53-61). The reactive unsaturated hydrocarbons include olefinic compounds such as ethylene, propylene, butylenes, or the like (Column 2, lines 21-22).

Ou invention further discloses that a mixture comprised of hydrogen and a light olefinic hydrocarbon, or light olefinic hydrocarbons, is contacted with oxygen or an

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oxygen-containing gas, e. g., air, over a catalyst highly selective to hydrogen oxidation at reaction conditions sufficient to oxidize the hydrogen component of the mixture to form water, while suppressing the reaction of the light olefinic hydrocarbons of the mixture (Column 2, lines 27-34).

It may be noted that the conditions described in Ou invention correspond to a typical fluidized bed catalytic reactor, where hydrocarbon feed is being cracked and the unsaturated hydrocarbons (olefins) and hydrogen are being produced as the products of reaction.

It would have been obvious to one skilled in the art at the time the invention was made to combine the teachings of Kennedy and Ou inventions by blending the hydrogen combustion catalyst disclosed in Ou invention into the FCC catalyst of Kennedy invention to conduct the catalytically cracked reactions and remove hydrogen in-situ by injecting oxygen into the reactor and thus improve the olefin yield.

Ou invention does not specifically mention about anaerobic hydrogen combustion, although Ou invention discloses the use of metal oxides selected from the elements of Groups I B, II B, III A, IV A, and V A of the Periodic Table (Column 10, lines 50-60).

It would have been obvious to one skilled in the art at the time the invention was made to claim combustion of hydrogen without any supply of external oxygen because the reaction would consume the oxygen from the metal oxides used as catalyst.

Kennedy invention discloses in figure 1 that steam is also introduced independently to the bottom of riser (10) through line (22) to help carry regenerated catalyst upwardly into the riser through transfer line (26) (Column 8, lines 35-38).

Kennedy invention discloses that finely divided zeolite can be admixed with the finely divided matrix material, and the mixture spray dried to form the final catalyst (Column 5, lines 12-14). The zeolite can also be grown in the matrix material, if desired (Column 5, lines 17-18).

Kennedy invention discloses that typical zeolites or molecular sieves having cracking activity which can be used herein as a catalytic cracking catalyst are well known in the art (Column 3, lines 15-17). Suitable synthetic zeolites which can be treated in accordance with this invention include zeolites X, Y, including chemically or hydrothermally dealuminated high silica alumina Y, A, L, ZK-4, beta, ZSM types (Column 3, lines 45-49). The preferred zeolites for this invention are the synthetic faujasites of the types Y and X or mixtures thereof (Column 3, lines 54-56).

Kennedy invention does not mention about the weight ratio of solid acid component to the weight of metal-based component.

Ou invention teaches the use of metal-based catalyst for hydrogen combustion.

It would have been obvious to one skilled in the art at the time the invention was made to combine the teachings of Kennedy and Ou inventions and determine the

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weight ratio of solid acid part of the catalyst and the metal part of the catalyst for easy formulation of a catalyst mixture to conduct catalytic cracking and hydrogen removal simultaneously.

Kennedy invention discloses that the cracking occurs in the presence of the fluidized catalyst composition defined herein in an elongated reactor tube (10) which is referred to as a riser (Column 8, lines 26-28). The riser exit temperature range is suitably about 900°F to about 1100°F (482°C to 593°C) (Column 8, lines 46-48). The riser pressure is between about 10 and about 35 psig (Column 8, lines 55-56). The residence time of both hydrocarbon and catalyst in the riser is very small and ranges from about 0.5 to 5 seconds.

Kennedy invention further discloses that no significant catalyst buildup within the reactor is permitted to occur, and the instantaneous catalyst inventory within the riser is due to a flowing catalyst to oil weight ratio between about 4:1 and about 15:1 (Column 9, lines 6-10).

Kennedy invention also discloses that the hydrocarbon which separates from the catalyst is primarily gasoline with some heavier components and some lighter gaseous components. The hydrocarbon effluent passes through cyclone system (54) to separate catalyst fines contained therein and is discharged to a fractionator through line (56) (Column 9, lines 16-22).

Kennedy invention does not mention about cracking catalyst chemically bound to the hydrogen combustion catalyst.

Ou invention discloses the hydrogen combustion catalyst.

It would have been obvious to one skilled in the art at the time the invention was made to combine the teachings of Kennedy and Ou inventions to prepare a chemically bound catalyst with dual functionality of catalytic cracking and hydrogen combustion for improved olefin and gasoline yield.

Kennedy invention does not mention about reduction of heat in the catalytic cracking reaction.

Ou invention discloses the hydrogen combustion in presence of a metal catalyst.

Since catalytic cracking is an endothermic reaction, and hydrogen combustion is an exothermic reaction, it would have been obvious to one skilled in the art at the time the invention was made to blend the Kennedy invention catalyst for cracking with Ou invention catalyst for hydrogen combustion. The advantage of this approach is that the net heat requirement for catalytic cracking done under such conditions will reduce due to the heat available from hydrogen combustion.

Kennedy invention discloses in Table II (Column 14), Table IV (Column 16), Table VI (Column 17), Table VII (Column 17, 18), Table VIII (Column 19), Table IX

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(Column 20), Table X (Column 21), and Table XI (Column 21, 22) hydrogen yields using a number of catalyst systems with additives (Column 13, lines 15-16).

Kennedy invention does not mention about the hydrogen yield in presence of metal catalysts for hydrogen combustion.

Ou invention discloses in Table 3 (Column 10, lines 27-28) that hydrogen yield in the feed (4.010 volume %) reduces to 0.029 volume % after treatment in the first and second reactors, and finally reduces to 4 ppm after treatment in the third reactor. A reduction from 4.010 to 0.029 volume % corresponds to a reduction of 99.3%.

It would have been obvious to one skilled in the art at the time the invention was made to combine the teachings of Kennedy and Ou inventions and achieve a substantial reduction in the hydrogen from catalytic cracking reaction products to improve the overall yield of olefins and catalytically cracked gasoline.

Kennedy invention discloses that the oil charge to be cracked in the riser is, for example, a heavy gas oil having a boiling range of about 650°F to about 1000°F (343°C to 593°C) (Column 8, lines 39-41). Suitable charge stocks for use with the present invention include crude petroleum, atmospheric or vacuum residua, deasphalted oils from such feed stocks, shale oil, liquefied coal, and tar sand effluent or other petroleum fractions which are suitable catalytic cracking charge stocks (Column 7, lines 49-54). It is known to those skilled in the art that the above-mentioned charge stocks contain varying amounts of paraffins, olefins, aromatics, and naphthenes.

Kennedy invention discloses that the charge stock to be cracked is passed through preheater (2) to heat it to about 600°F (315°C) and then is charged into the bottom of riser (10) through the end of line (14) (Column 8, lines 30-33). Steam is also introduced independently to the bottom of riser (10) through line (22) to help carry regenerated catalyst upwardly into the riser, which flows to the bottom of the riser through transfer line (26).

Figure 1 of Kennedy invention discloses that the hydrocarbon and catalyst exiting from the top of each riser is passed into a disengaging vessel (44). An instantaneous separation between hydrocarbon and catalyst occurs in the disengaging vessel (Column 9, lines 11-16). The catalyst separated from hydrocarbon in disengager (44) immediately drops below the outlets of the riser so that there is no catalyst level in the disengager but only in a lower stripper section (58). Steam is introduced into catalyst stripper section (58) through sparger (60) to remove any entrained hydrocarbon in the catalyst (Column 9, lines 22-28).

Catalyst leaving stripper (58) passes through transfer line (62) to a regenerator (64). This catalyst contains carbon deposits which tend to lower its cracking activity and as much carbon as possible must be burned from the surface of the catalyst. This burning is accomplished by introduction to the regenerator through line (66) of approximately the stoichiometrically required amount of air for combustion of the carbon deposits (Column 9, lines 29-36). Hopper (86) is disposed at the bottom of the regenerator for receiving regenerated catalyst to be passed to the bottom of the reactor riser through transfer line (26) (Column 10, lines 4-7). The hydrocarbon which separates

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from the catalyst is primarily gasoline together with some heavier components and some lighter gaseous components (Column 9, lines 16-19).

It is known to those skilled in the art that the heavier components as mentioned above comprise the unconverted feed.

Kennedy invention discloses a number of catalyst systems containing the additive used in the claimed process and they are described to demonstrate utility for vanadium passivation (Column 13, lines 15-17). The reference catalyst (Commercial catalyst 2) used in this test was OCTACAT D, an octane-enhancing cracking catalyst containing an ultra-stabilized hydrogen "Y" zeolite in an alumina sol generated matrix (Column 13, lines 50-55).

Claims 56, 57, and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kennedy et al (US Patent 5,002,653) in view of Ou et al (US Patent 5,907,076) and further in view of Chin et al (US Patent 5,057,205), Green et al (US Patent 4,980,052), and Hettinger, Jr. et al (US Patent 4,450,241).

Kennedy and Ou inventions do not disclose additives for CO oxidation, coke oxidation, SO_x reduction and NO_x reduction.

Chin invention discloses a catalytic cracking process especially useful for the catalytic cracking of high metal content feeds including resids in which the feed is cracked in the presence of a catalyst additive comprising an alkaline earth metal oxide

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and and an alkaline earth metal spinel, preferably a magnesium aluminate spinel which acts as a trap for vanadium as well as an agent for reducing the content of sulfur oxides in the regenerator flue gas (Abstract).

Green invention discloses a process for reduction of emission of noxious nitrogen oxides with the flue gas from the regenerator of FCC plant by incorporating in to the circulating inventory of cracking catalyst separate additive particles that contain a copper loaded zeolite. With such preferred additive, CO emissions also are reduced (Abstract). The peak NO_x emission dropped to 86 ppm, a reduction of 85%, while the integrated NO_x emission dropped 79% relative to the unadditive case (Column 11, Example 10, lines 14-16). The peak NO_x emission dropped to 102 ppm, a reduction of 82%, while the integrated NO_x emission dropped 77% relative to the unadditive case (Column 11, Example 11, lines 27-29).

Hettinger invention discloses a process of adding metal additives to catalyze the endothermic removal of carbon with CO₂. The metal additive is present on the catalyst in an amount sufficient to catalyze the endothermic removal of carbonaceous material in the presence of CO₂ rich gas at regeneration temperature below 1500°F (Abstract).

It would have been obvious to one skilled in the art at the time the invention was made to combine the catalysts and additives disclosed in Kennedy, Ou, Chin, Green, and Hettinger inventions and reduce the SO_x, NO_x, CO, metals, and coke deposit from the regenerator gases for an improved and environmentally clean FCC process.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 32, 37-57, 62-69 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 30-71 of copending Application No. 10/358,569. Although the conflicting claims are not identical, they are not patentably distinct from each other because the applicant claims a process for treating a hydrocarbon feed stream under cracking conditions and simultaneously combusting hydrogen in presence of a catalyst system comprising (1) a solid acid component, (2) a metal based component from Groups 1, 2, 3, and 4 to 15, and oxygen or sulfur and (3) a filler or binder or support.

Application No. 10/358,569 claims the same process using similar reactants and catalyst system under identical operating conditions.

Claims 32, 37-57, 62-69 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 24-57 of copending Application No.10/369,880. Although the conflicting claims are not identical, they are not patentably distinct from each other because the applicant claims a process for treating a hydrocarbon feed stream under cracking conditions and simultaneously combusting hydrogen in presence of a catalyst system comprising (1) a solid acid component, (2) a metal based component from Groups 1, 2, 3, and 4 to 15, and oxygen or sulfur and (3) a filler or binder or support.

Application No. 10/369,880 claims the same process using similar reactants and catalyst system under identical operating conditions.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chin et al, US Patent 4,889,615.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on MF 6:30 AM-3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ps/041306


Walter D. Griffin
Primary Examiner